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REMARKS

Applicants respectfully request that the above application be reconsidered, as amended.

Claims 1-13 are currently pending; Claims 14-32 have been withdrawn by the Examiner from further consideration as being drawn to a non-elected invention.

Claims 1 and 8 have been amended to clarify that the diffusion barrier layer is formed on the substrate, such as disclosed in paragraphs [0019] and [0020], or deposited on the substrate, such as disclosed in paragraph [0017].

Claim 1 has also been amended to specify that the protective coating comprises at least two platinum group metals, and comprises at least about 40% by weight of platinum or rhodium, as described in lines 5-7 of paragraph [0031] of the specification.

Claim 1 has also been amended to specify that the protective coating has a thickness of from about 10 to about 20 microns. This range is disclosed in line 15 of paragraph [0031] of the specification, using the lower thickness of about 10 microns.

Claim 6 has been amended to specify that the protective coating comprises at least three of the platinum group metals, as disclosed in line 5 of paragraph [0031] of the specification.

No new matter is introduced by the above amendments, and it is requested that they be entered.

A. Response to the Restriction Requirement Under 35 USC 121

On page 2 of the Office Action, and pursuant to 35 USC 121, the Examiner states that restriction to one of the following inventions is required:

- I. Claims 1-13, drawn to a turbine engine component, classified in class 428, subclass 698.
- II. Claims 14-32, drawn to a method for forming a protective coating system, classified in class 427, subclass 252.

Referring to MPEP 806.05(f), the Inventions I and II are said to be "distinct" because the product as claimed can be made by another and materially different process, such as forming the coating system in a mold and applying the system to the substrate in a lift-off process. It is said that because Inventions I and II have acquired a separate status in the art as shown by their different classification, restriction for examination purposes is proper.

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As requested by the Examiner, this confirms the provisional election of the Invention I subject matter (i.e., the turbine engine component of Claims 1-13). Applicants also respectfully request that the Examiner reconsider and withdraw this restriction requirement. MPEP Section 803 states:

"If the search and examination of an entire application can be made without serious burden, the Examiner must examine it on the merits, even though it includes claims to distinct or independent inventions."

Other than referring to different patent classifications for Inventions I and II, no other basis is provided for why searching both inventions would be difficult or burdensome. Accordingly, Applicants respectfully request that the restriction requirement be withdrawn and that Inventions I and II as defined by Claims 1-32 be examined together.

B. Response to Rejection of Claim 7 under 35 USC 112 as Indefinite

Claim 7 has been rejected as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. It is stated: "Claim 7 refers to the protective coating having at least about 50 wt % Pt or Rh, or mixtures thereof. Claim 7 is dependent upon claim 6, which requires at least two metals for the protective layer. Is claim 7 to be interpreted as having at least two metals, and additionally at least about 50% wt of Pt and/or Rh?"

Claim 6 as amended specifies that the protective coating comprises at least three of the five named metals. Claim 7 further specifies that the protective coating comprises at least about 50% by weight of platinum or rhodium, or mixtures thereof (i.e., the protective coating comprises at least three of the named metals, and at least about 50% by weight of the coating is platinum or rhodium, or mixtures thereof). This is consistent with the description in lines 5-7 in paragraph [0031] of the specification. It is thus submitted that there is nothing indefinite about Claim 7. Accordingly, reconsideration and withdrawal of this rejection is requested.

C. Response to Rejection of Claims 1-5 and 8-12 under 35 USC 102(a) as Anticipated by U.S. Patent 6,627,323 Nagaraj et al.

Claims 1-5 and 8-12 have been rejected under 35 USC 102(a) as anticipated by U.S. Patent 6,627,323 (Nagaraj et al.).

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1. The '323 reference is cited as teaching a thermal barrier for a turbine component, where the component includes a superalloy substrate, and the coating comprises a bond coat (24), a layer of alumina (28), a layer of zirconia (26), a second layer of alumina (32), a layer of platinum group metal (34), and a third layer of alumina (36), successively.

2. Regarding Claims 2-4 and 9-11, it is said that the second layer of alumina is considered the barrier layer, and may be 0.5-50 microns thick.

3. Regarding Claim 5, it is said that the method of deposition of the layer is not considered to structurally define the coating over the prior art.

4. Regarding Claim 8, it is said that an additional layer may be provided on the third alumina layer, and this layer may comprise tantula, considered a ceramic thermal barrier.

5. Regarding Claim 12, it is said that the metal layer may consist essentially of platinum, and therefore is considered to be more than 50% of the layer composition.

Applicants respectfully traverse this rejection.

As noted above, independent Claims 1 and 8 have been amended to clarify that the oxide or nitride diffusion barrier layer is formed on or deposited on the substrate. This clearly distinguishes the '323 reference, wherein a separate bond coat layer 24 overlies the surface of the substrate 22 (see column 3, lines 51-53) and is between the substrate and the alumina layer 28. As noted in column 3, lines 55-59 of the '323 reference, the bond coat layer 24 is typically an aluminum-rich composition, such as an overlay coating of an MCrAlX alloy or a diffusion coating such as a diffusion aluminide or a diffusion platinum aluminide. However, as explained in paragraphs [0003]-[0005] of Applicants' specification, there is a tendency for aluminum from the aluminum-rich protective layer to migrate inwardly toward the substrate. Aluminum diffusion into the substrate reduces the concentration of aluminum desired in the outer regions of the protective coatings. Moreover, the aluminum diffusion can result in the formation of a diffusion zone in an airfoil wall, which undesirably consumes a portion of the wall. Simultaneously, migration of the traditional alloying elements like molybdenum and tungsten from the substrate into the coating can also prevent the formation of an adequately protective alumina layer.

These are the problems that Applicants' invention seeks to overcome by forming or depositing the diffusion barrier layer on the substrate. As noted in the last sentence of paragraph [0016], the diffusion barrier layer essentially creates a stable zone between the underlying

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substrate and the protective coating that prevents interactions, which are usually undesirable, between the substrate and the coating. Independent Claims 1 and 8 are thus distinguished from the '323 reference. Since Claims 2-5 and 9-12 are dependent on Claims 1 and 8 respectively, they are also patentable over the '323 reference.

For the foregoing reasons, Applicants submit that Claims 1-5 and 8-12, as amended, are novel and non-obvious over the '323 reference.

D. Response to Rejection of Claims 1-3 and 5-9 under 35 USC 102(b) as Anticipated by U.S. Patent 5,427,866 (Nagaraj et al).

On page 4 of the Office Action, Claims 1-3 and 5-9 have been rejected under 35 USC 102(b) as anticipated by U.S. Patent 5,427,866 (Nagaraj et al.).

1. The '866 reference is cited as teaching a protective coating for turbine components, where the component includes a substrate comprising a nickel or cobalt-base superalloy, and the coating comprises a bond coat (34), an alumina layer (36), and a metal layer of Pd, Pt, and/or Rh (38).
2. Regarding Claims 2, 3, and 9, the alumina is considered the barrier layer.
3. Regarding Claims 5, 15, and 16, the Examiner states that the alumina is thermally grown.
4. Regarding Claims 6 and 7, the Examiner says the metal layer may be formed of Pd, Pt, Rh or combinations thereof, and that the metal layer can have a thickness of 0.0001-0.001 inches (2.54-25.4 microns).
5. Regarding Claim 8, it is stated that a ceramic thermal barrier layer (4) is deposited over the metal layer.

Applicants respectfully traverse the rejection.

As discussed above in Part C regarding the '323 reference, FIG. 4 of the '866 reference also discloses the presence of a bond coat layer 34 between the alumina layer 36 and the substrate 32.

In contrast, and as explained above in Part C, Applicants avoid such a bond coat layer by forming or depositing the oxide or nitride diffusion barrier layer on the substrate. Claims 1 and 8

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have been amended to clarify this structure. Claims 1 and 8, and dependent Claims 2, 3, 5-7 and 9, are thus distinguished from the '866 reference.

For the foregoing reasons, Applicants submit that Claims 1-3 and 5-9, as amended, are novel and non-obvious over the '866 reference.

E. Response to Rejection of Claims 1-7 under 35 USC 102(b) as Anticipated by U.S. Patent 5,484,263 (Nagaraj et al.)

Claims 1-7 have been rejected under 35 USC 102(b) as being anticipated by U.S. Patent 5,484,263 (Nagaraj et al.).

1. The '263 reference is cited as teaching a reflective coating system including a superalloy substrate, a first layer of alumina (14), and a reflective layer of Pt or Pt-Rh.

2. Regarding Claims 2-4, the alumina is considered the diffusion layer and can have a thickness of 0.1-25 microns.

3. Regarding Claim 5, the Examiner says that the method of deposition of the layer is not considered to structurally define the coating over the '263 reference.

4. Regarding Claims 6 and 7, it is stated that the reflective layer may comprise an alloy of Pt and Rh and have a thickness of up to about 10 microns.

Applicants respectfully traverse this rejection.

As explained above, Claim 1 has been amended to specify that the protective coating comprises at least two platinum group metals, and comprises at least about 40% by weight of platinum or rhodium.

Regarding its reflective coating 16, the '263 reference discloses, in column 3, lines 46-54:

Numerous materials are known in the art to have high reflectivity, though materials particularly suitable for the present application include the noble metals, such as platinum, platinum-rhodium alloys, and gold, as well as aluminum. The above materials are preferred for the reflective coating 16 of this invention because of their high reflectivities/low emissivities and their ability to (be) provide a highly reflective surface when formed using conventional deposition techniques.

The '263 reference does not specifically disclose the composition of such a platinum-rhodium alloy. Other reflective materials such as gold and aluminum are not suitable as the protective coating of the present invention. Thus, it is submitted that a person of ordinary skill in

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the art would have no reason or motivation to form a protective coating comprising at least two platinum group metals selected from the group consisting of platinum, palladium, rhodium, ruthenium and iridium, and wherein the coating comprises at least about 40% by weight of platinum or rhodium, based on the limited disclosure of reflective coatings in the '263 reference. Certainly, the '263 reference does not disclose or suggest a protective coating comprising at least three of the metals specified in Claim 6, or comprising at least about 50% by weight of platinum or rhodium, or mixtures thereof, as in Claim 7.

Moreover, Claim 1 has been amended to specify that the protective coating has a thickness of from about 10 to about 20 microns. In contrast, the '263 reference discloses forming a reflective coating 16 which is sufficiently thick, preferably up to about 10 micrometers, to yield an opaque coating, and having a sufficiently micro-smooth finish as to maximize the reflectivity of the coating 16. In Applicants' invention, the protective coating is thus thicker and used for a different purpose than the reflective coating of the '263 reference.

For the foregoing reasons, Applicants submit that Claims 1-7, as amended, are novel and non-obvious over the '263 reference.

F. Response to Rejection of Claims 1-3 and 5-9 under 35 USC 102(e) as Anticipated by U.S. Patent 6,652,987 (Allen et al.)

Claims 1-3 and 5-9 have been rejected under 35 USC 102(e) as being anticipated by U.S. Patent 6,652,987 (Allen et al.).

1. The '987 reference is cited as teaching a reflective coating for a turbine engine component, where the component comprises a nickel or cobalt based superalloy, and a coating comprising: a bond coat (24), a ceramic oxide layer (26'), a noble metal layer (30'), and an additional ceramic oxide layer (26").

2. Regarding Claims 2, 3, and 9, the Examiner says the ceramic oxide layer may be zirconia.

3. Regarding Claim 5, it is stated that the method of deposition of the layer is not considered to structurally define the coating over the '987 reference.

4. Regarding Claims 6 and 7, it is stated that the metal layer may comprise Pt, Pt alloys, Pd, Pd alloys, Rh, Rhodium alloys, Ir, Ir alloys, and mixtures thereof, and that the metal layer can have a thickness of 0.5-25.5 microns.

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5. Regarding Claim 8, the ceramic oxide layer (26") is considered a thermal barrier layer.

Applicants respectfully traverse this rejection.

As discussed above in Part C regarding the '323 reference, the '987 reference discloses the presence of a bond coat layer 24 between the oxide layer 26' and the substrate 22.

In contrast, and as explained above in Part C, Applicants avoid such a bond coat layer by forming or depositing the oxide or nitride diffusion barrier on the substrate. Claims 1 and 8 have been amended to clarify this structure. Claims 1 and 8, and dependent Claims 2, 3, 5-7 and 9 are thus distinguished from the '987 reference.

For the foregoing reasons, Applicants submit that Claims 1-3 and 5-9, as amended, are novel and non-obvious over the '987 reference.

G. Response to Rejection of Claim 4 and 10-13 under 35 USC 103(a) as Unpatentable Over U.S. Patent 5,427,866 (Nagaraj et al.)

Claims 4 and 10-13 have been rejected under 35 USC 103(a) as being unpatentable over U.S. Patent 5,427,866 (Nagaraj et al.).

1. The '866 reference is cited as teaching a coating system as discussed in Part D above but without mentioning a specific thickness of the thermally grown alumina layer, although teaching that this layer is thin. According to the Examiner, absent a showing of unexpected results, it would have been obvious to one of ordinary skill in the art to provide the alumina layer of U.S. 5,427,866 with a thickness sufficient to provide a layer that is sufficiently adherent to the underlying bond coat.

2. Regarding Claims 12 and 13, the '866 reference is cited as teaches a metal layer of Pt, Rh, Pd and combinations thereof.

Applicants respectfully traverse this rejection.

As discussed above in Part C regarding the '323 reference, the '866 reference also discloses the presence of a bond coat layer 34 between the alumina layer 36 and the substrate 32.

In contrast, and as explained above in Part C, Applicants avoid such a bond coat layer by forming or depositing the oxide or nitride diffusion barrier on the substrate. Claims 1 and 8 have been amended to clarify this structure. Dependent Claims 4 and 10-13 are thus distinguished from the '866 reference.

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Accordingly, Applicants submit that Claims 4 and 10-13 are patentable over the '866 reference.

H. Conclusion

It is believed that the above represents a complete response to the Examiner's rejections and places the application in condition for allowance. Accordingly, reconsideration and allowance of Claims 1-13 are respectfully requested.

Applicants would appreciate the courtesy of a telephone call should the Examiner have any questions or comments with respect to this response.

Respectfully submitted,

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